HERCULES

Operator's Handbook

MODEL JX

JXA - 3⅜″ x 4¼″
JXB - 3⅝″ x 4¼″
JXC - 3¾″ x 4¼″
JXD - 4″ x 4¼″

HERCULES
MOTORS CORPORATION

CANTON, OHIO
U. S. A.

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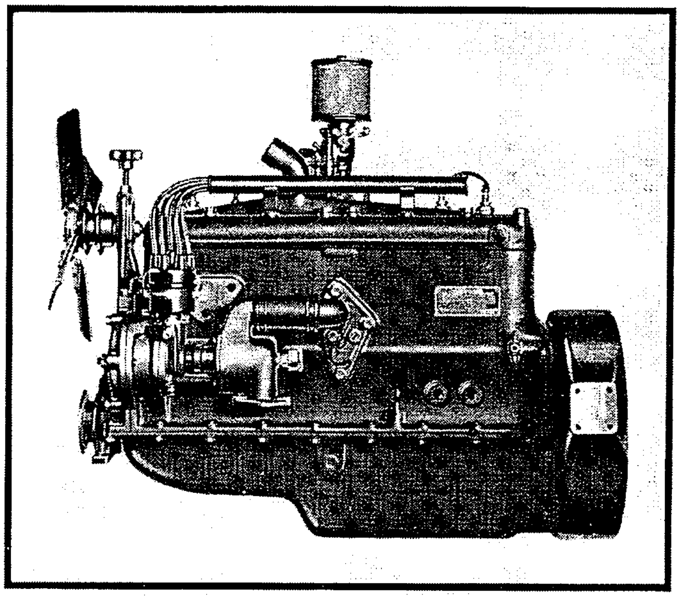
MODEL JX



Hercules Motors Corporation

Canton Ohio

ENGINE

"JX" Model

THE Hercules "JX" Model engine is of the six-cylinder type, having bores of $3\frac{3}{8}''$, $3\frac{5}{8}''$, $3\frac{3}{4}''$ and $4''$ and a stroke of $4\frac{1}{4}''$. It has seven main bearings $2\frac{1}{2}''$ diameter and is built for relatively high engine speeds.

Cylinder Block. The cylinder block and crankcase are cast in one piece, with the water jacket running the full length of the cylinder bore. This construction results in a very rigid unit, which is necessary in order to eliminate vibration.

Main Bearings. The use of seven main bearings permits a main bearing being placed on each side of the connecting rod bearing, and this construction helps to eliminate vibration at high speeds. The center and rear main bearing caps are held in position by four alloy steel cap screws $\frac{7}{16}''$ in diameter while the balance of the bearing caps use two alloy steel cap screws of $\frac{1}{2}''$ diameter. The bearing caps are all drop forgings, and the babbitt metal is poured directly to the cap after same has been properly tinned. This method permits a firm bond between the babbitt and the steel of the cap, and insures the bearing metal having a firm backing which helps to prevent high bearing temperatures. The upper half of the main bearings which are not subjected to the pressures due to the power stroke are of the bronze back babbitt lined shell type.

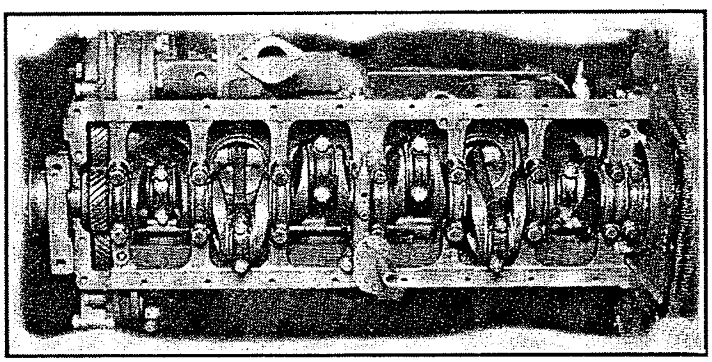


Illustration No. 1

A few very thin shims are used which permit subsequent adjustment of the bearings without filing.

Main Bearing Adjustment. Due to the large diameter of the crankshaft and the use of seven main bearings, care must be taken when adjustments are made to prevent too tight a fit. Tight fitting main bearings result in a sluggish engine as well as very poor pick-up at low speeds.

Some engines of this series are built with removable shell type bearings in both the cap and crankcase. These are adjusted the same as the poured in babbitt type cap and shell bearings by the use of shims.

Connecting Rod. The connecting rod bearing is poured directly into the steel of the rod after tinning, and is bored to crankshaft size so as to enable the rod to be fitted without being scraped to size. A few thin shims are used between the cap and the main part of the rod, following the practice used on the main bearings. Some of the later type connecting rods have oil pockets machined in the babbitt on either side of the rod and cap above and below the split line. These rods singly or in sets are

interchangeable with the rod which does not include this pocket. The piston pin is clamped rigidly in the upper end of the rod by means of a clamp screw which passes through a notch in the pin. This method of clamping the pin eliminates the possibility of the cylinders becoming scored due to the piston pin floating against the side of the cylinder.

The clamp screw is locked either with a lock wire or lock washer.

When installing a new connecting rod or making adjustments on connecting rod bearings, care must be exercised not to fit the bearing too tight. On these full pressure lubricated engines it is a common practice to fit the bearings tight enough to just turn by the selection of proper shims to permit the connecting rod bolt nuts to be drawn up tight. A .002 shim is then added between the rod and cap so that the fit will just permit the proper oil clearance. The side clearance should be adjusted to approximately .005″.

Some engines of this series are built with removable shell type bearings in the connecting rod. These are adjusted by shims which are found on the side opposite the bearing shell lock. Unlike the poured babbitt type the shims are only on one side.

Piston Pin. The pin must be fitted in the aluminum alloy piston much tighter than it is fitted in the iron type piston, for as soon as the piston is heated due to the operating temperature of the engine the expansion permits the pin to loosen to a normal running fit. At ordinary room temperature, the pin should require all of the force which the mechanic is able to exert by the palm of his hand to bump the pin into the piston boss. At no time should it be possible at air temperature to move a new pin by means of the thumb. After the rod and pin have been assembled to the piston, the weight of the rod should not be sufficient to cause the rod to drop when the piston is held horizontally, as shown in Illustration No. 2. but it should be possible to move the connecting rod when the piston is moved suddenly up and down.

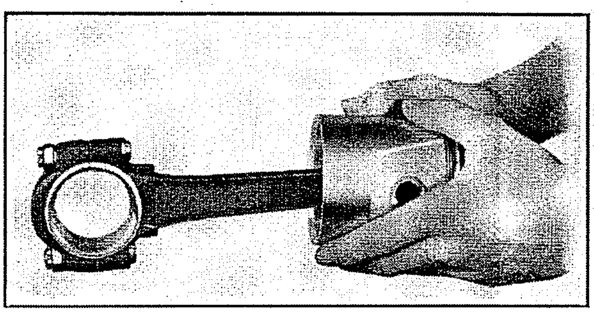


Illustration No. 2

Piston pins in the cast iron pistons should be fitted looser and it should be possible to push pin through the bushings with the thumb. Take particular caution to tighten the clamp screw in the top of the connecting rod very tight, and tighten the lockwire so that it cannot possibly be moved. Be sure that the piston and connecting rod are properly lined up so that the rod will not tend to cock the piston in the cylinder.

Piston Fits (Aluminum). This type of aluminum alloy piston permits the piston being fitted with the same clearance as a cast iron piston, but due to the fact that the skirt is split on one side, a .003 feeler can be pulled out from between the piston and the cylinder bore when held between the thumb and finger. The aluminum piston is larger at the extreme bottom of the skirt than it is near the rings, consequently the feeler fit must be taken between the bottom of the skirt and the cylinder bore.

CAUTION

The aluminum pistons are all stamped showing the front of the piston and it is necessary that care be used to insure the pistons being installed with the split toward the water pump side of the engine. This is due to the bearing area on the thrust side of the piston being wider than it is on the split side.

Piston Fits (Iron). The iron pistons should have from three to three and a half thousandths clearance, using feelers to secure proper fit.

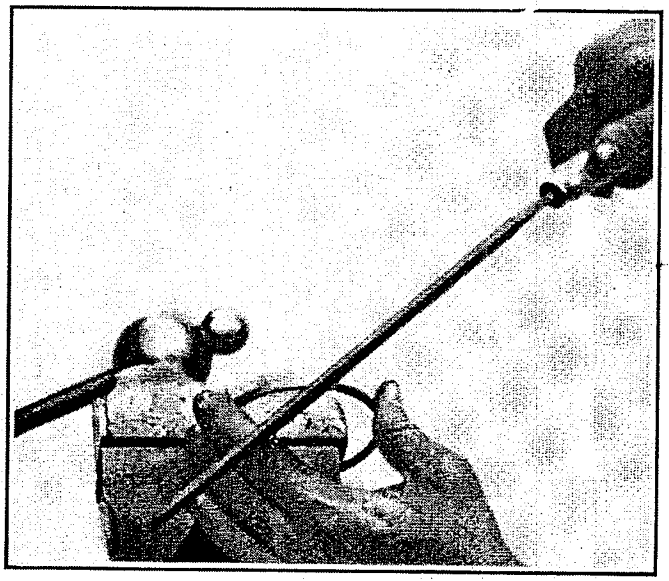


Illustration No. 3

Piston Ring Fitting. The method of fitting, as well as holding the rings while filing, is shown in Illustration No. 3. You will note from the illustration that the mechanic is closing the two ends together, which should result in the ends of the rings being parallel. Note that ring is pinched at but one point of its circumference and pressed together with the thumb and forefinger, the file cutting on both sides. This insures parallelism of end surfaces.

The vise jaws should be lined or covered with lead or copper to prevent mutilation of the smooth side of the rings. Also, the vise should not be screwed up more than just enough to hold the ring.

Butt Clearance. The butt clearance or end gap should be approximately .015″ on the lower rings, while the top ring should have approximately .020″ clearance. Check it by inserting rings in bore and pushing down with the piston skirt to square up ring before testing gap with feeler gauge.

Piston Ring Groove Clearance. All rings should be true as regards to width, and just wide enough to be a light "rolling" fit, each in their respective grooves. See Illustration No. 4. If the ring is of the correct width and not "snaky," it should remain suspended in the groove. Should the ring be too wide (which

Illustration No. 4

will seldom be the case), it can be reduced to fit its groove by lapping on a sheet of (000) emery cloth, this emery cloth having been placed on a surface plate or other flat surface. The mechanic, however, should be sure that the pressure on the ring is the same at all points. Each ring should have from .001 to .0015 clearance in its groove, except oil ring in lower grooves, which should have approximately .0025 clearance.

Assembling Piston Rings to Piston. In assembling the rings, if a pair of ring pliers or similar tool is not used the bottom ring should be assembled first. In this case the rod and piston assembly should be reversed and the lower ring slipped on over the open end of the piston. A substitute for the pliers or spreaders is two strips of steel .010 or .015 of an inch thick by about one-half of an inch wide. Each strip is bent double and the two crossed as shown in Illustration No. 5. Whatever method is used, care must be taken to see that the rings are not sprung out of their natural shape and permanently distorted.

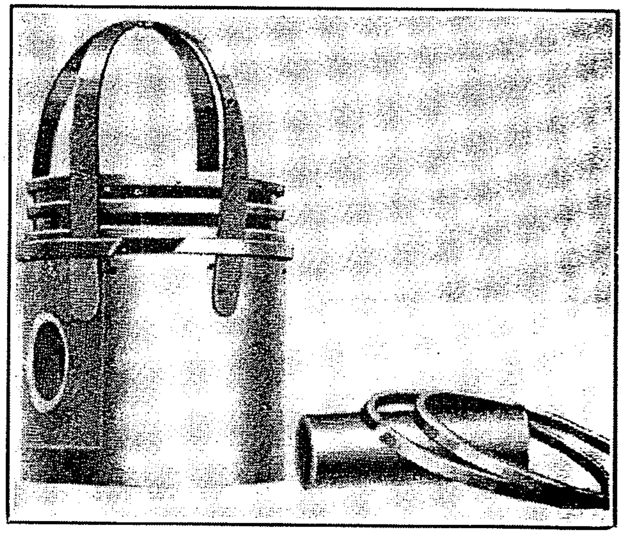
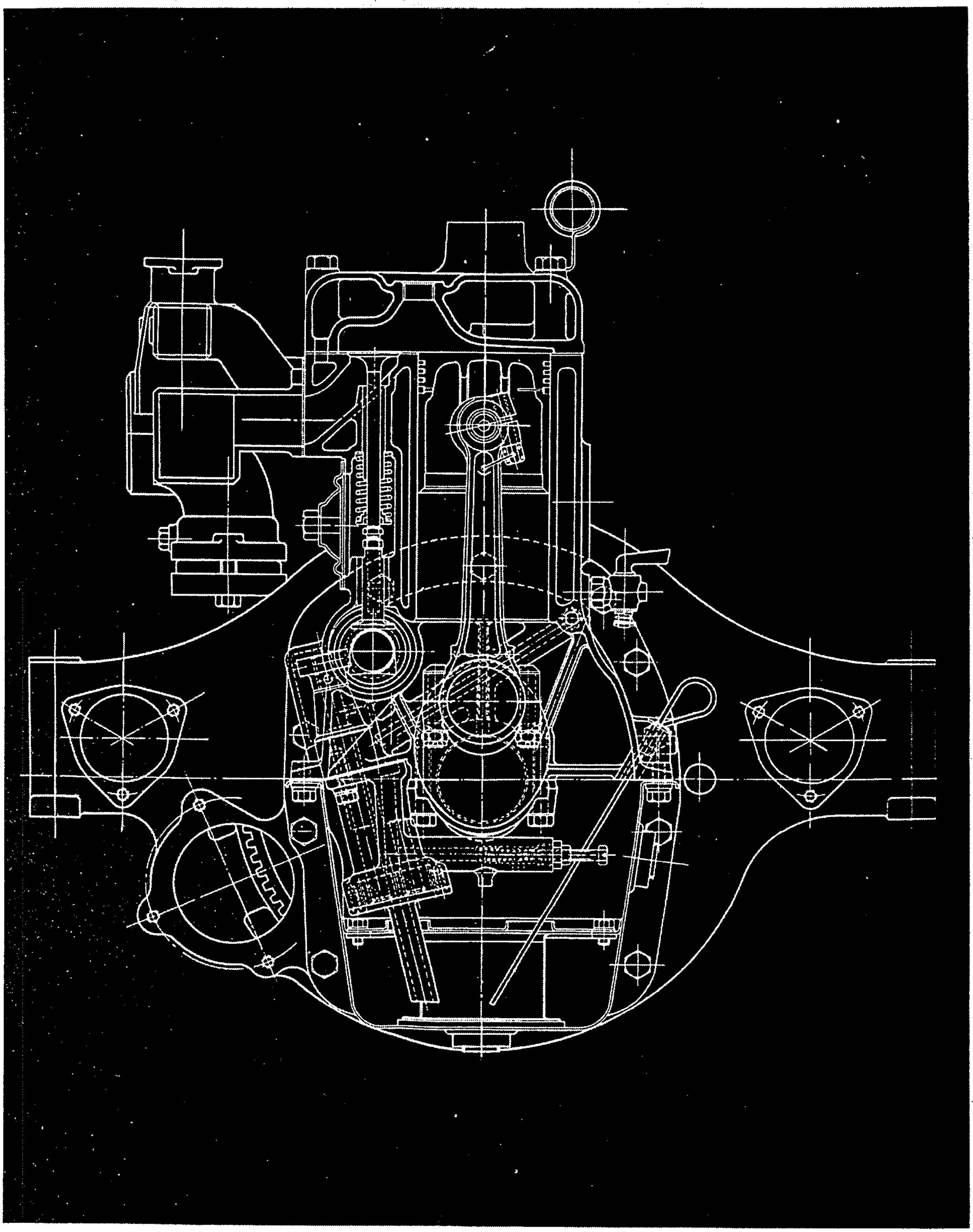


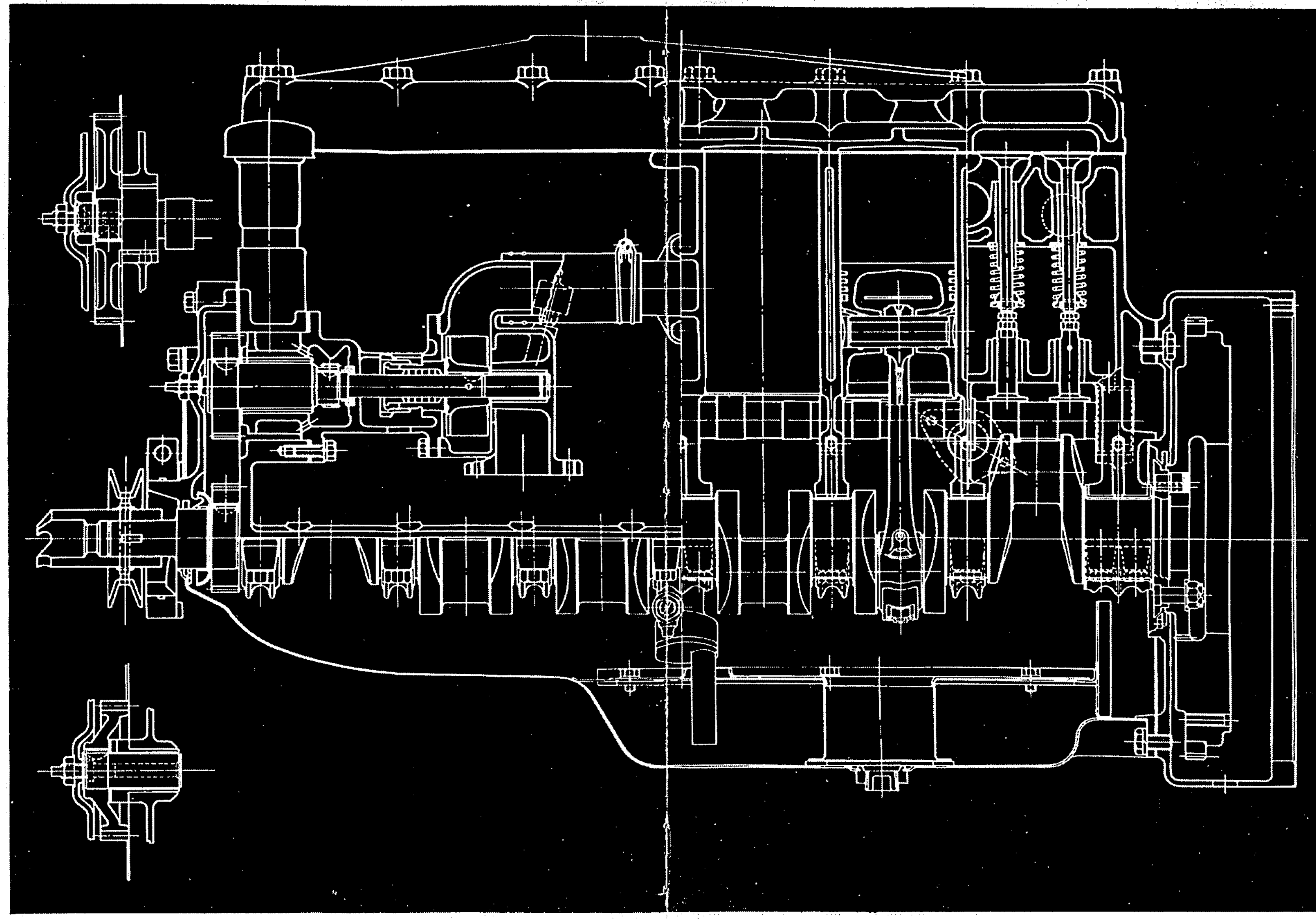
Illustration No. 5

Valve Tappet Adjustment. The amount of clearance necessary between the valve tappet and valve stem to permit satisfactory operation and long life to valve seats and valves is greatly dependent upon the frequency with which this clearance is checked and adjustment changed when minimum operating clearances are reached. The usual recommended clearances in order to prevent possibility of trouble and eliminate frequent inspection is .010 on the intake and .020 on the exhaust, but such clearances result in tappet noises which are considered objectionable by some operators and it is possible to secure satisfactory results if the intake clearance is set at .008 and the exhaust at .010 or .012, providing such settings are made with the engine hot as it would be at the end of a regular run. Such clearances will necessitate more frequent inspection and valves which are permitted to run with less clearance are much more liable to give trouble.

Valve Tappet Removal. The valve tappet guides are pressed directly into special webs in the cylinder block. This construction prevents any misalignment between tappets and camshaft, due to both parts being supported in the same casting. The replacement of a tappet, therefore, requires the removal of the camshaft.



Front End Sectional View of Engine



Sectional View of Engine
Cam and Idler Gear Adjustments are Shown in Upper and Lower Left Hand Corner

Oiling System. The absence of all copper tubes is a very decided advantage and makes the adjustment of all bearings much more accessible. All oil channels are drilled in the case. The oil pump is bolted directly to the center main bearing web, and the suction tube extends directly into the strained oil compartment, under the baffle plate in the oil pan. The timing gear compartment of the earlier series built before May 1933 was lubricated by means of a metered hole in the plug which closes up the main horizontal oil channel running from the back to the front end of the engine. Various construction was used in connection with the plug having this metering hole. The earliest consisted simply of a tube fastened to the rear of the plug. This was later changed to incorporate a strainer surrounding the tube. Stoppage of this metering hole results in robbing the gear compartment of normal quantities of oil and this opening should be checked occasionally by removing the gear cover and idler gear which gives access to the plug.

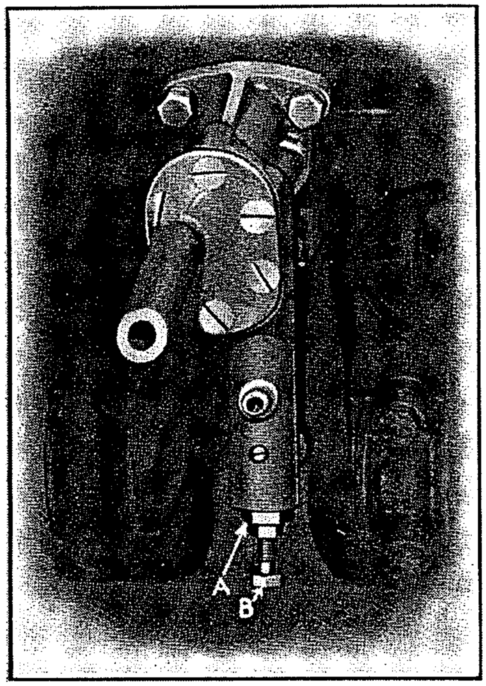


Illustration No. 6

Later series are lubricated by means of drilled holes in the idler gear shaft which registers once every revolution with the hole in the case drilled through the idler gear bushing into the main horizontal oil channel. This construction eliminates the metered hole in the plug used in the first engines of this type and also eliminates the possibility of clogging of the oil holes. Any of the changed parts used with the later type oiling system can be used singly or as an assembly on the earlier engines having the original type oiling system, but the first type parts cannot be used in the later type engines.

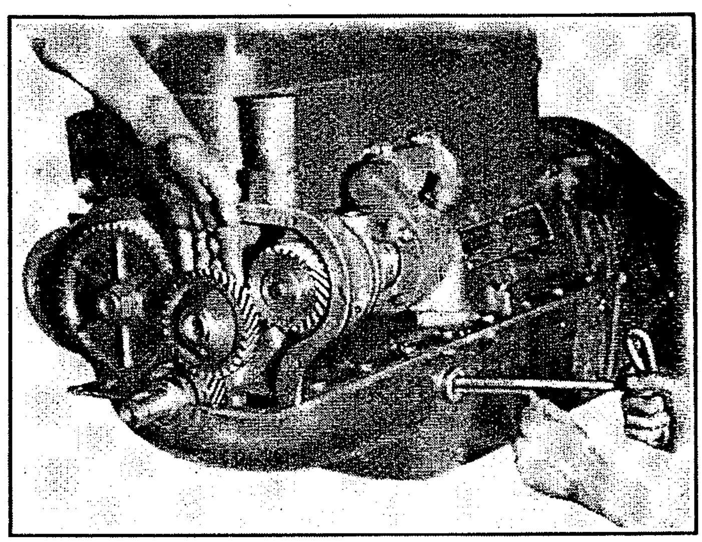


Illustration No. 7

Oil pressure Adjustment. Should adjustment become necessary, the change is effected by increasing or decreasing the spring compression on the regulating plunger which is located in the cylindrical extension of the oil pump body. In order to change the compression of this spring, it is necessary to loosen locknut "A" and

turn cap screw "B" IN for increased pressure and OUT for decreased pressure. After the adjustment is made, the lock nut must be tightened. This adjustment can be made by means of the special wrenches shown in illustration No. 7 without removing the oil pan. The normal pressure with hot oil is twenty-five pounds at maximum engine speed.

Oil Pump Construction. The oil pump is of the usual gear type, having steel gears pressed on to the hardened and ground steel shafts. No gasket is used between the cover and the body. This construction prevents difficulties which sometimes result due to an incorrect thickness of gasket being used.

Oil Pan Construction. The oil pan is a simple sheet metal stamping with a baffle plate covering the oil pump portion of the oil pan. The holes through this baffle plate, which permit the entrance of the oil level stick or gauge and the oil pump suction tube, are flared upward in order to prevent the dirty oil from the engine running into the strained oil compartment. The large flat surface of the baffle permits metal and carbon particles settling out of the oil and oil flows down through the oil screen and in this manner all oil is strained before it again reaches the oil pump. Whenever the oil pan is removed, care must be exercised when it is replaced to insure a tight fit at the rear upper corner. Both the horizontal and vertical cap screws must be gradually tightened at the same time otherwise one of the flanges would be tightened before the other and this would result in the oil pan being distorted and might result in an oil leak. The gasket at the front end must cover the points of the oil pan, and the metal of the oil pan should not rub against the crankshaft. Illustration No. 8 shows the construction of the oil pan with baffle plate assembled.

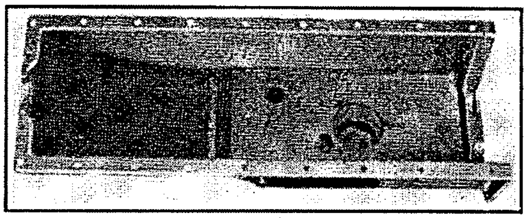


Illustration No. 8

Timing Gear Construction. The timing gears are all supported on large diameter shafts. The idler gear is pressed on to a shaft which rotates in a bushing pressed into the front end of the crankcase. The idler gear and shaft can be easily removed as soon as the gear cover is taken off the front of the engine, as shown in Illustration No. 7. The idler gear shaft has a small flange on the front end, consequently the gear must be pressed off and on over that portion of the shaft which runs in the bushing. The cam gear is pressed on to the front end of the camshaft and is retained by means of a nut. The camshaft and the cam gear can be drawn out the front end of the engine, care being taken to prevent the valve tappets from falling down and interfering with the removal of the shaft. The oil pump must be removed before this operation is attempted, due to the cam bearings being larger than the oil pump drive gear on the camshaft.

To Adjust End Play in Cam, Idler and Water Pump Shafts. Illustration No. 9 indicates the method of adjusting the end play in cam, idler and water pump shafts. When end play is present, a very decided knock, which is more pronounced at idling speeds, will be heard. To eliminate this condition, adjustment is provided as shown. Lock nut "B" should be loosened and held from turning while the adjusting screw "A" is screwed up against the thrust button "D" in the end of the shaft. Care must be used not to tighten this screw too tight. The thread fit in gear cover "C" permits the adjustment to be made by means of the fingers. Turn screw "A" up as far as it will go, then back off 1/8 of a turn and hold it from rotating while lock nut "B" is tightened.

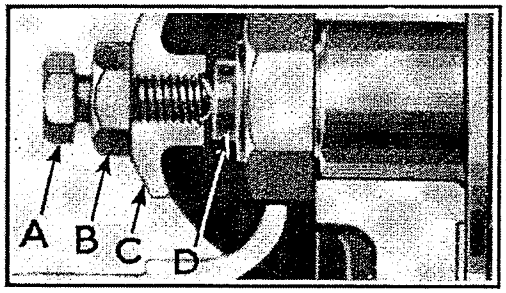


Illustration No. 9

If screw "A" cannot be tightened by means of the fingers, turn it up with a short wrench as far as it will go without a great amount of force being used and then back it off about 2″ movement on the end of a 6″ wrench, holding it while lock nut "B" is tightened.

The latest type adjusting screw is equipped with a hard fiber end which assists in preventing wear between the screw and hardened plunger in the end of the gear shafts. Adjustment should be made in exactly the same manner as mentioned above.

Construction at the Front End of the Crankcase. The only shaft extending through the gear cover is the crankshaft to which is attached the fan pulley. This construction minimizes the possibility of oil leaks at the front end of the engine. An oil slinger is pressed on to the crankshaft directly in front of the crank gear, and the oil pan and gear cover are recessed to accommodate the slinger. An oil retainer made from a cork composition is fitted in grooves machined in oil pan and gear cover and assists in retaining all oil at the front end.

Construction at the Rear End of the Crankcase. The rear end of the crankshaft has been especially designed to prevent any excess oil being thrown or blown out of the crankcase. The rear end construction is similar to that shown in Illustration No. 10. There are no felt washers used. The centrifugal action of the oil when the engine is running tends to be thrown off the knife edge of the large diameter oil thrower, which is a part of the rear end of the crankshaft. Care must be exercised, however, to insure proper clearance between the crankshaft flange and the fly wheel housing.

Clearance Between Crankshaft Flange and Flywheel Housing. At all times it is desirable to maintain a clearance of approximately .015″ between the flywheel housing and the crankshaft flange. This clearance can be tested by means of a feeler as shown in Illustration No. 11. If the flange should rub on the flywheel housing, this may be due to excessive end play in the crankshaft and should be remedied by installing a new rear crankshaft bearing, being properly fitted for end clearance, of not over .006 of an inch. If for any reason it becomes necessary to remove the flywheel housing, replace or adjust the main bearings, the clearance between the flywheel housing and the crankshaft flange should be checked. Any contact between the shaft and housing will result in an oil leak.

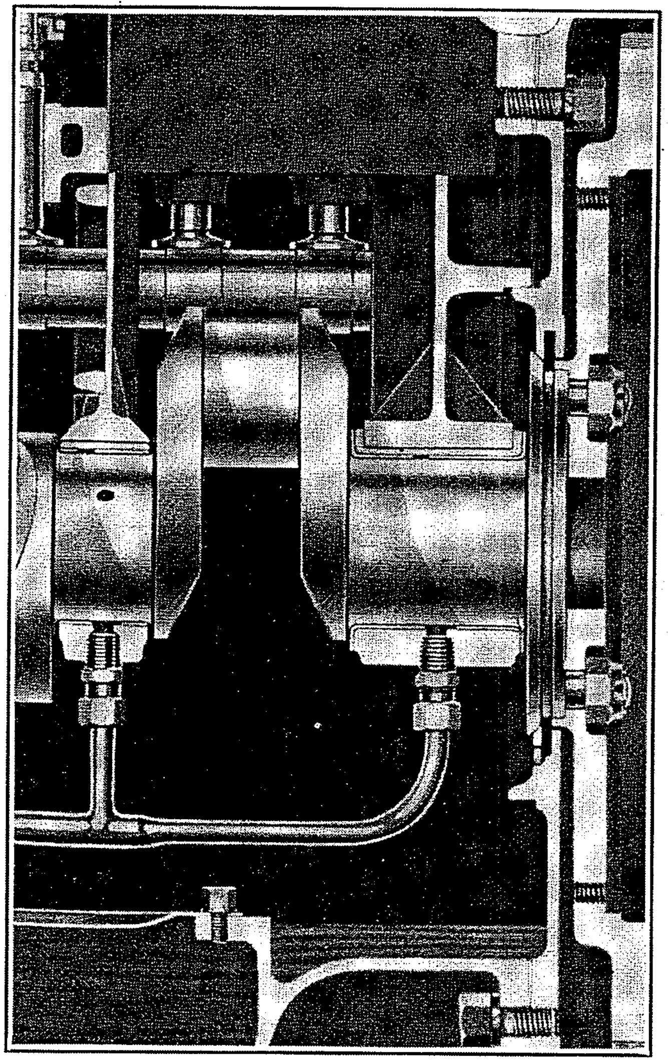


Illustration No. 10

Caution. After the original position of the crankshaft has been changed and an interference is found between the flange and the housing, the housing can be scraped out slightly or an extra gasket can be used between the housing and crankcase.

Water Pump Drive. The water pump and drive mechanism are readily removed from the engine without disturbing the gear cover, as shown in Illustration No. 12. It is only necessary to disconnect the water connections and remove the three cap screws holding the sleeve and water pump cover to the crankcase. The gear and shaft can be removed from this assembly after the water pump body and impeller have been removed from the shaft. Be sure to remove the water pump impeller key, otherwise the packing retainer and packing will be damaged when the shaft is pulled out through the front of the housing. The water pump gear is removed and reassembled over the small end of the shaft.

The water pump shaft is supported on two bushings—a very large diameter bushing just to the rear of the water pump gear and a small diameter bushing at the extreme rear of the water pump body. The front bushing is automatically lubricated by the oiling system of the engine, and the rear bushing is lubricated by means of the grease cup on the water pump

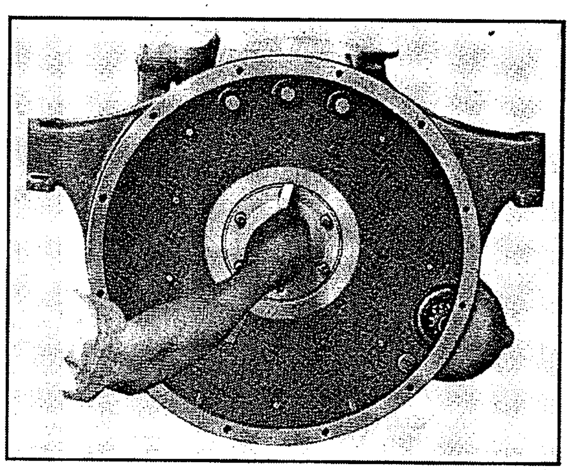


Illustration No. 11

housing. Half a turn a day of this grease cup is much better than three or four turns once a week.

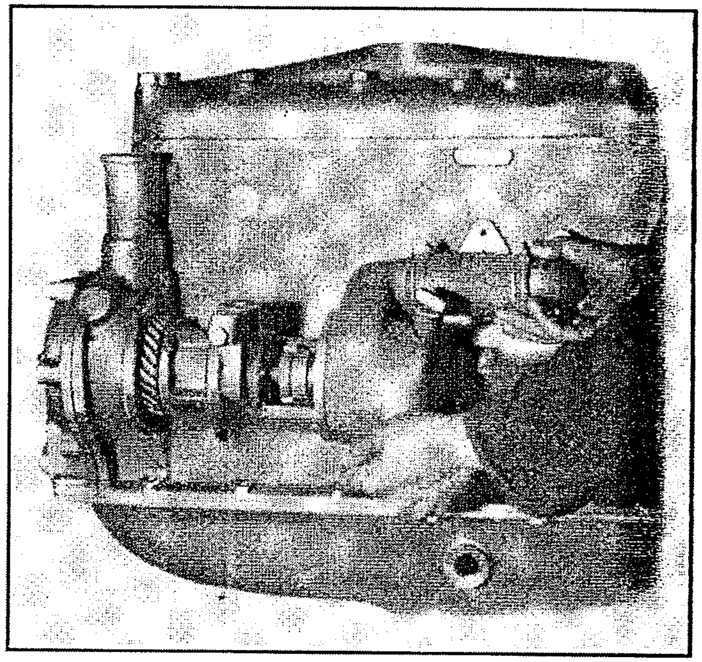


Illustration No. 12

Water Pump Packing Adjustment. Due to the length of packing used in the water pump, but little pressure is required on the adjusting nut. This should never be tightened with any considerable force. If an ordinary adjustment does not correct the water leak, check the condition of the packing and shaft.

Water Drain. The inlet from the water pump to the cylinder block is above the bottom of the water jacket, which extends the full length of the cylinder bore, consequently it is always necessary when draining the cylinder to open the drain cock at the extreme rear left hand side of the engine.

Lubrication. The most essential requirement for the successful operation of any engine is oil. Lack of oil or the use of poor oil is responsible for most engine failures. If plenty of GOOD oil is used, the larger part of all engine troubles will be eliminated.

Cheap Oil. Using cheap, low grade oil is the height of extravagance, as the bearings, pistons, cylinders and gears wear so much more rapidly when the engine is operated with poor or diluted oil that the saving in oil is lost many times in the increased cost of repairs.

Use Good Oil. The larger oil companies have made a careful and thorough study of engine lubrication and it is best to be governed by their chart of recommendations. Use only nationally branded oils, manufactured by responsible refiners.

In summer and on all hard-worked engines use a No. 40 S.A.E. viscosity oil. In winter, No. 20 or No. 30 S.A.E.

Oil Draining. Drain your oil pan frequently, and refill with the correct grade of fresh oil. Frequent oil changes are desirable.

Do Not Flush the Crankcase With Kerosene. It is impossible to drain all the pockets and passages without dropping the oil pan—and the kerosene which is trapped remains to dilute the fresh oil. Drain crankcase while the engine is warm and the oil agitated. This will carry off the sediment.